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*Wm. J. Henry,
Secy. &c.
Washington City, D. C.*

MINERAL RESOURCES

By order of Chas. Whittlesey -

OF THE

CORDILLERAS OF NORTH AMERICA,

PARTICULARLY AS TO

PRECIOUS METALS.

WITH A MAP.

Price Twenty-Five Cents.

BY

COL. CHAS. WHITTLESEY,

OF THE LATE GEOLOGICAL SURVEYS IN
OHIO, WISCONSIN, AND THE NORTHWESTERN STATES.

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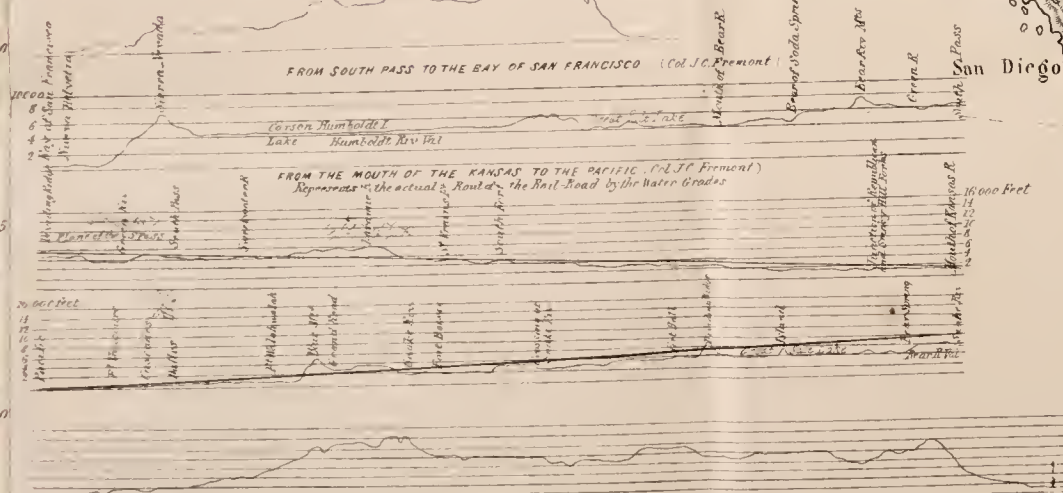
NORTH AMERICA

- Copper.
- Silver & lead.
- Gold
- Coal



FROM SOUTH PASS TO THE BAY OF SAN FRANCISCO (Col. J.C. Fremont)

FROM THE MOUTH OF THE KANSAS TO THE PACIFIC (Col. J.C. Fremont)



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THE CORDILLERAS OF AMERICA.

PHYSICAL AND GEOLOGICAL STRUCTURE.

The principal mineral wealth of the western Continent is found in a Range of Mountains which overlook the Pacific Ocean. One great Chain extends from the Straits of Magellan, Northerly through South America, Central America and North America to the Arctic Sea. The line of greatest elevation between the two oceans is much nearer to the Pacific Coast than the Atlantic. In South America and in Central America, up to the City of Mexico, there is but one main uplift known in geography as the Andes. This lofty and continuous ridge maintains a general parallelism with the Sea Coast, because the position of the Coast line was fixed by the elevation of the Mountains. It extends without interruption from latitude 50 South, to 70 North and is the seat of those mines of precious metals for which South America was coveted and conquered by the Spaniards three hundred years ago. Not far south of the city of Mexico, in the State of Oajaca, the main line of

the Andes is separated into two branches. One lies to the east of that city, pursuing a course nearly north and parallel with the gulf of Mexico through Queretaro, New Leon and Coahuila, into Texas, under the general name of the Sierra Madre. This name has not a very definite meaning in physical geography. In Mexico it is used as a general term for a main chain or the "mother" of mountains.—North of the Rio Del Norte, it is known as the Guadalupe and sometimes as the Organ Mountains, which continue northward to the east of Santa Fe as far as Pikes Peak.—Throughout the Republic of Mexico, there are silver mines in the Sierra Madre.

In Mexico, the mountain system is generally spoken of as the "Cordilleras;" a title given to it by Humboldt. It embraces the elevated portion of the country which constitutes a high and broken surface dropping off rapidly to both oceans. The Sierra Madre is the eastern edge. On the west is the Sierra Nevada often called the northern Andes, which is near to, and parallel with the Pacific Ocean and the Gulf of California. It extends through Michoacan Sinaloa Sonora, and Arizona, into California. Like the Sierra Madre it is more like the edge of an elevated broken plateau fronting to the west than a range of mountains. Silver mines of great richness are found in it, from the city of Mexico to the Gila and farther north at Washoe in Nevada. From California, northward, this range goes by the name of the Cascade Mountains, passing into British Co-

lumbia and the Russian possessions. It has in its general course a rude parallelism to the Sea Coast, and terminates in the promontories near Behrings Straits.

Gold has been found on the slopes of the Sierra Nevada, or Snowy Range, in the lower spurs and hills near its base from the Gila river to Frazer's River.

There are connected with the Sierra Nevada and the Sierra Madre many subordinate ranges. The Sierra Mimbres of Chihuahua, which divides the waters of the Rio Del Norte from those of the Colorado, is one, and is a metal bearing range. On some maps it is called the Sierra Madre. There are cross ranges and corrugations of the general uplift, such as surround the great interior basin of the Humboldt River, known as the Wasatch and Oregon Mountains. A lower chain lies between the Sierra Nevada and the sea, under the name of the Coast Range. It commences at the extremity of the peninsula of Lower California, and stretches northward, always in view from the ocean, through California and Oregon. In this there are reported to be mines of silver, in Lower California. In California, Oregon and Washington there is coal in the foot hills, and near San Francisco there is one of the richest quicksilver mines of the world.

From Pikes Peak, northward, to the Arctic sea are the Rocky Mountains; extensions of the Sierra Madre of Mexico under a new name. For greater convenience of description I embrace the entire North American extension

of the Andes in the term *Cordilleras North America*. This vast extent of strata must be regarded physically and geologically as one system. For extent and scenic grandeur it has no competitor. Its summits rise from 6,000 to 13,000 and 17,000 feet above the ocean, many of them like Arequipa, Popocatepetl and St. Helens, throwing out perpetual fires from above the line of perpetual ice.

Throughout the entire length there is an uniformity of geological structure. Mineral veins yielding the precious metals are characterised the world over by similar geological associations. The backbone of this Continent is the result of a vast rent in the crest of the earth, occupying about one third of its circumference. From this fissure the igneous rocks protruded along the whole line, at different intervals of time, constituting the core or central mass of the upheaval. Those rocks are granite, sienite, porphyry and trachyte. They are to be distinguished from eruptions of lava that occur in all eras, even in our own day, but in irregular and spasmodic efforts of the interior forces. Overlying the igneous rocks are micaceous schists, gneiss, talcose slate, indurated clay slates, and siliceous slates, which are without fossils, and are called in general terms "Metamorphic rocks." The central igneous rocks sometimes penetrate the Metamorphic System; the result of disturbances subsequent to the epoch of the azoic slates. In the slates are found the most valuable veins. They have their source frequently in the igneous rocks below, and radiating from them and particu-

larly from the junction of the two systems, penetrate the schists, cutting through them into their overlying limestones. The character of those veins will be shown in more detail in what follows. It will there be seen that there is a conformity in the geological structure of this great mountain chain quite as striking as its magnitude in its physical sense.



PAST SUPPLY OF PRECIOUS METALS.

The question of the product of precious metals in different parts of the world is so important that it has engaged the attention of the best statisticians ever since the mines of New Spain began to furnish gold to Europe. Before the time of Humboldt, no less than sixteen persons of scientific reputation had given their statements, of the quantity derived from America, prior to the present century. They differed so widely that Humboldt made it a subject of enquiry during all his journeyings in the Spanish Colonies. After great labor and with access to the records of mining in the New world, he published an account of the annual product from the discovery of America in 1492 to the year 1803, a period of 311 years.

This exhibit evinced so much research and so much personal examination of the mines both in Mexico and in South America, that it has been received as the best authority. Under the Spanish system, mineral veins belong to the crown, which derives an income by a royalty, or rent,

upon the metal produced. In this way the official returns, if correctly rendered, would give the exact product of the mines. But the miners possessed great ingenuity and no scruples in concealing rich pieces of ore or native gold and silver, about their persons. The Spanish officials are not considered to be more honest than other people, not being wholly above suspicion of bribery. It was the interest of all parties in the Vice royalties of the new world far away from the surveillance of the crown to reduce in the official reports the amount of gold and silver produced.

Here is Humboldt's Statement:

PRODUCT OF GOLD AND SILVER of the mines of the New continent from its discovery to the year 1803, and for some subsequent years.

EPOCH.	NO. YEARS.	TOTAL IN DOLLARS.	ANNUAL AVERAGE.	AUTHORITIES.
1492 to 1500	8	2,000,000	250,000	HUMBOLDT.
1500 to the discovery of Potosi 1545	45	135,000,000	3,000,000	"
1545 to 1600	55	605,000,000	11,000,000	"
1600 to 1700	100	1,600,000,000	16,000,000	"
1700 to 1750	50	1,125,000,000	22,500,000	"
1750 to 1803	53	1,771,900,000	32,300,000	"
Tot. and Av.	311	5,238,900,000	16,845,338	
1790 to 1830 Peru and Brazil wanting	40	910,070,727	22,787,159	London Mining Journal.

The period of 40 years from 1790 to 1830 covers 13 years of the latter part of Humboldt's tables. The total amount as stated by McCulloch is \$911,486,380, differing slightly from the report of the London Mining Journal. Both results are based upon the reports of British Consuls in differ-

ent parts of the world, who were directed to procure statistics in relation to precious metals. Of this sum \$708,655,535 is the product of Mexico in silver, and \$32,182,265 in gold. In the table of the consuls, the United States did not figure largely. In 1830 only \$109,000 in gold is credited to us.

Soon after Humboldt left America the French Armies attacked the old Kingdom of Spain, which enabled her colonies in the new world to get up a successful revolt. A quarter of a century of disorder had an effect upon the product of the mines and upon the accuracy of the returns of what they actually produced. During all the period of Spanish occupation embraced in the foregoing table, mining was carried on by the rudest mechanical appliances. This work was done by a rude people, in an age when they had no assistance from steam engines.

It follows that the mineral veins of South America were very rich or very easily wrought in order to give the yield above stated. Mr. McCulloch thinks some abatement should be made from Humboldt's figures.

Geo. Sumner, Esq., of Boston, asserted in a public lecture some years since, that he had examined the shipping bills which are still preserved at Madrid of the treasure received by the crown. He thinks the sums are usually overrated. The Spanish writers who accompanied Cortez and Pizarro were somewhat given to exaggeration. Their imaginative methods of description, have their influence upon those who study Spanish history. If it is true that the simple mind-

ed Atahualpa, after having been made prisoner through the duplicity of Pizarro, his generals and confessors, filled the room in which he was confined, with gold up to the celebrated red mark on its walls, he must have had at command 400 to 600 millions. This money should have gone directly to Spain, where such an amount could not have escaped attention.

The workings of the Peruvians, under the Incas, were still more rude than those of the Spaniards. They were principally confined to the washing of auriferous sands, as is usually the case in barbarous nations.

A people who had little commerce did not require much gold, for the purposes of money. They used it for ornaments and as a material of value to be hoarded. A small amount, as compared with the same population in modern and more civilized ages, answered the Peruvians for all purposes, to which they applied the precious metals.

All these circumstances go to show that we are in the habit of overestimating the quantity of gold and silver found in this country by the Spaniards, and the Portuguese, and also the amounts derived by them after the conquest.

A mint was established in Mexico in the year 1535, the total coinage of which is given by Dr. Fisher to the year 1850, a period of (315) three hundred and fifteen years. It amounts to the sum of \$2,667,828,851. The great mine at Potosi, formerly in Peru, but now in Buenos Ayres, was dis-

covered in 1545. In 1847, Dr. Ure upon the authority of Humboldt estimates the entire yield of the veins around Potosi at \$1,150,000,000.

I offer these general statements to show that there are upon the American Continent vast resources as to precious metals. By consulting the accompanying map it will be seen that the area over which they are found, or are likely to be found, in North America is much greater than in South America.

In South America and up to the city of Mexico, there is but one mountain chain. From thence to the Arctic Sea, there are two main elevations with a space between them of 500 to 1000 miles in width. I shall show that on both slopes of these ranges and in the elevated and broken intermediate country, embracing the basins of the Colorado, the Humboldt, and the Columbia Rivers, gold and silver have been found as far north as the region has been examined. By geological analogy and inference it should exist in the same ranges still farther north, through the Russian possessions. In addition to this great extent of mining country, we must also take into account the improved methods of extracting metals and of working mineral veins.

Gold is a metal so universally diffused in nature, that there are very few nations of the first class in whose limits it is not found. It exists like other metals in veins, but in a native state and not as an ore. It is imperishable or rather incapable of change, under the effects of acids and oxi-

dating gases. As the vein matter which surrounds it is disintegrated and modified by chemical and mechanical agencies it remains always the same. It is crushed by the drift or diluvial forces into grains, scales and dust, but not altered in a chemical sense, as copper, iron and silver are. In the form of dust it is transported long distances by currents of water, but never perishes and remains at the base of the surrounding sand and gravel a pure, glittering metal, easily distinguished by every one. Almost all iron and copper pyrites contain some of it. When they are decomposed, the gold which was mixed with them mechanically, separates.

Thus, almost all soils, earths and bodies of drift materials contain some gold. The chemists of the mint of the United States have detected it in the alluvial clay which underlies the city of Philadelphia. But, in general, the quantity is so small that it is of no practical value. Only a few square miles, compared with the territory of a nation, has it in sufficient abundance to pay for extraction. Such tracts when it is found loose in the form of lumps, nuggets, pepitas, grains, scales and dust are called "placers." It is mingled with boulders, gravel, sand and clay of irregular richness, derived by the agencies above named from true veins or rocks more or less distant.

Thus the supply of gold is resolved into a question of the cost of procuring it, or the comparative value of labor. In this country placers are numerous and so are the mines.

As soon as this war shall cease, thousands of our young men who are now soldiers will seek for adventures and for fortunes in the gold fields of the west. The information we now have is conclusive, as to the mineral value of that region, from Arizona to the British Provinces. If the British and Russian possessions were ours, emigration would not stop at latitude 49. There are inducements of climate and soil, besides those of the precious metals, sufficient to attract our citizens northward as far as the Arctic Circle. But without this the relations of British Columbia to the Pacific States of the Union are so close, that the gold procured there will most of it come to San Francisco.

The detailed statements I shall now proceed to give will, I think, sustain my estimates of a probable increase of *one hundred* per cent. during the next five years, and of an increase upon that of 50 per cent. in the five following years.

IRON ORE.

The value of ores of iron, depends upon a cheap supply of charcoal or of mineral coal in the vicinity. Iron ore exists in Mexico, but timber being scarce and coal wanting, no use is made of it. In Arizona, not far from where the Santa Cruz River crosses the southern boundary of the United States, Mr. Wrightson saw specimens of excellent magnetic ore.

Iron ores of sedimentary origin are found in *Colorado* near Denver City, from which, according to the report of the Surveyor General, iron is now made. Capt. Mullen, of the Topographical Engineers, and Dr. John Evans, Geologist for Oregon, discovered a very rich hematite on the *Bitter Root* Mountains of *Idaho*, in a region where timber is abundant.

Dr. D. D. Owen made an analysis of this ore. It is as follows: Per oxide 89.95 (equal to *metallic* iron 62.993) Alumina 6.90. Alkalie 0.10, Silex 1.90, Water 0.05. These results show a remarkably pure and rich ore.

The Jesuit missionaries of Oregon say there is iron ore on the *Kootonie River*, near our northern boundary. It has also been found in Utah, where the Mormons manufacture iron. Dr. Evans, in his report, (not yet printed,) mentions a specimen from Oregon, the locality of which is lost, that gave 42.25 metallic iron. In the Cascade Mountains he found the hydrated oxide, containing 47.61 per cent. Another specimen of specular oxide, from the *Spokane Mountains*, gave 62.81 per cent., and one from the Cascade Mountains, 64.02. Wherever it is known that there is a bed of pure hard mineral coal, the first duty of the people in its vicinity is to seek for iron ore.

So common a mineral attracts little attention, though it is indispensable to civilized man. There can be little doubt that special examinations on the waters of the Pacific Slope will disclose an abundance of iron ore. Those lower ranges

and spurs of the Rocky Mountains north of the South Pass, including the Black Hills, are heavily timbered and will give an ample supply of charcoal. The streams furnish an unlimited amount of water Power for furnaces and for iron works of every description. Further south there is in many places a large growth of musquite which makes good coal.

The analysis of the mineral coal on *Bellingham Bay*, Washington Territory, discloses facts of great importance in reference to iron manufactures. Dr. Owen regards it as semi-anthracite. It yields coke 54.50, volatile gases and moisture 43.18, ashes 2.30 sulphur 0.47. It is of a bright black color, hard, specific gravity 1.333 and does not crumble on exposure. Several other valuable coals are mentioned under the head of mineral coal.

MINERAL COAL.

Although a belt (or belts) of limerock exists in or near the main crest of the Rocky Mountains, which belongs to the carboniferous system, no beds of workable coal have been found in it. The numerous explorers who have crossed these mountains from Arizona to British Columbia, agree that there are limestones of the coal measures in abundance, but that there are only limited developements of the coal shales. On the route from Denver City to Salt Lake, Mr.

Berthaud reports a seam of coal that is regarded as belonging to the carboniferous system. But all the other localities thus far brought into notice, are connected with rocks of the cretaceous or tertiary eras. These rocks occupy an extent of country between the Mississippi river and the Pacific which, when compared with that of other formations, is prodigious. East of the mountains they constitute the surface beds over those vast plains through which the waters of the Missouri, Nebraska, Arkansas, Platte and Rio Grande rivers, flow towards the sea. On the west, the Colorado and its branches, the Mohave, Humboldt, Sacramento and Columbia Rivers, show the same formation upon their banks.

The most valuable and most numerous coal seams hitherto developed are in the cretaceous. The coal of both the tertiary and cretaceous systems is in general soft, sulphurous, and has a large proportion of ashes.

The "*seams,*" or beds, (frequently called "*veins,*") in these formations cannot be depended upon for uniformity in thickness, quality or extent, like those of the true coal measures. It will be much more difficult to find coal of that pure and solid character which is required in the common stack furnace for making iron, in these than in the carboniferous rocks. In the present state of information, the best indications for beds of the ancient coal period are to the east and south east of Utah Lake, where the black shales exist, and where specimens have been found.

Captain Simpson's party observed coal and carboniferous shales about Latitude $38\frac{1}{2}$, North, Longitude 112, west. To abbreviate as much as possible the exhibit of localities, and the descriptions of quality, thickness, &c., I have constructed the following table. Where no mention is made of the associated rocks it will be understood that they are *cretaceous*.

Mr. Hector of the Canada Survey, reports carboniferous limestones and rocks containing coal plants in the Rocky Mountains north of the American line.

KNOWN LOCALITIES OF MINERAL COAL,

In and West of the Rocky Mountains, in the order of their occurrence from South to North.

LOCALITY.	PHYSICAL CHARACTER.	AUTHORITIES.
NEW MEXICO—On the San Juan River.	Specimen 1245, (Smithsonian) pure hard and black.	Dr. J. S. Newberry.
CALIFORNIA—San Juan Mission, Monterey Co.	Tertiary coal, soft.	Land Office Report, 1862.
Monte Diablo, Cal.	5 ft. thick ; used at San Francisco for S Boats; seam traceable several miles ; sells at \$12 per ton.	“ “ “
NEVADA TERRITORY--near Dayton.	Not described.	“ “ “
COLORADO TERRITORY—Near Colorado city.	3 feet thick, several mines worked.	“ “ “
Near Golden city.	Not described.	“ “ “
West of the Snowy Mountains on road from Denver city to Salt Lake.	Probably carboniferous.	“ “ “
Latitude 38½ North. Longitude 112 West.	“ “	Capt. Simpson, Topographical Eng.
South Boulder Creek.	11 feet thick ; dip south west 75 ; 400 tons sold at \$10 ; below this one, seam 4 feet and another 5 feet thick.	Land Office Report, 1862.
Coal Creek, 15 miles south of Denver City. Also in T 14, south range 1 west, and T 1 south R 69 W.	4 feet thick, dip South East 10°.	“ “ “

LOCALITY.	PHYSICAL CHARACTER.	AUTHORITIES.
White River Valley.	6 feet thick.	L'd Office Rep. 1862.
Arkansas River, 20 miles below Canon City.	Not described.	" " "
South Platte River, 2 miles above Plum Creek.	3 feet thick, soft; dip S. East 60.	" " "
Head waters of Green River, 20 to 30 miles west of S. Pass.	Thin and soft.	Capt. Fremont.
OREGON—Willamette River.	Used on Steamboats.	Report of General Land Office, 1862.
Dwamish River.	Coke, 52.08; Volatile Gases, 24.08; Moisture, 12.00; Ashes, 10.40.	Dr. Evan's Report.
WASHINGTON TERRITORY—Bellingham Bay.	Spec. 1220, (Smithsonian) specific gravity, 1.333; Coke, 54.50; Volatile Gases and Moisture, 43.18; Ashes, 2.30; Sulphur, 0.47; contains Amber, but no Bitumen; used in Steamboats; very good.	" " "
Fitzhugh Mine.	Similar to that at Bellingham; highly recommended by Dr. Owen.	" " "
Nonaimo " Bigelows " Goose Bay " Cape Flattery"	Similar to that at Bellingham; highly recommended by Dr. Owen.	" " "
Cowlitz River.	Lignite, inferior.	" " "
VANCOUVER'S ISLAND—Douglass Mine.	Workable thickness, bright black color.	Land Office Report.
DAKOTA TERRITORY Near Fort Berthold, Missouri River.	Good thickness; tertiary, soft; many years on fire. Carbon, 37.00; Volatile Gases, 54.50; Ashes, light green color, 8.50; Sp.g. 1.33.	Capt. Galpin. Dr. Owen.

LOCALITY.	PHYSICAL CHARACTER.	AUTHORITIES.
IDAHO—Three Buttes, 60 miles north of Fort Benton.	Soft ; tertiary ; thin.	Capt. Pallisser.
Bear's Paw Mountains, 8 miles north Mis- souri River.	Used by Blacksmith's.	Capt. Galpin.
NEBRASKA TERRITORY —Fort Clark.	Carbon, 38.00 ; Ashes, (white) 11.50 ; Vola- tile Gases and Mois- ture, 50.00 specific gravity, 1.34.	Dr. Owen.
CANADA—Near bound- ary on the Kootanie River.	No description.	Gov. Stevens. R. Road Reports.
Red Deer River, Rocky Mountains.	12 ft. thick and 14 miles in length ; on fire many years.	James Hector, Geo- logist with Capt. Pallisser.
Battle River, Lat. 52 28, Long. 111 30, w.	Good thickness, soft.	" " "
Edmonton House, on the Saskatchewan River.	4 ft. thick, soft ; terti- ary.	" " "
Mountain House, 52 29 n, Long. 115 w.	Little known.	" " "

QUICKSILVER AND OTHER MINERALS.

In the analagous formations in Mexico there are numerous mines of Quicksilver; the richest of which is at Guadalcaraaz. It is found in Queretaro Zacatecas, Jalisco, Guerrero, and San Luis.

As yet there is but one principal mine in the United States, which is near San Francisco, at New Almaden, and is famous for its product, and the ease with which it is worked.

From similarity of geological structure, it is reasonable to expect veins of the Sulphuret of Mercury (*Cinnabar*,) in many other places.

The facility with which it has been wrought at New Almaden, has brought down the price of Quicksilver the world over. In 1852 there was produced 39,671 flasks, of 75 pounds each, or 2,959,325 pounds. In 1854 the yield of this mine was 20,000 flasks—previous to which time 3,500,000 pounds had been raised. Nature has thus furnished, for the miners of California, the means of amalgamating the product of their mineral veins, in cheapness and profusion hitherto unknown.

Valuable metals besides Gold and Silver have been discovered. Platinum, Iridium, Osmium and Antimony, are found; but, as yet, only in small quantities. There are, near Monterey and Los Angeles, permanent springs of Petroleum, and, over large spaces, the rocks which contain liquid Bitumen are known to exist.

COPPER.

In Calaveras County, California, Copper mines have been wrought to a limited extent. During the year 1862 (\$366,000) three hundred and sixty-six thousand dollars worth of this metal was raised at the Calaveras mines, from which (\$60,000) sixty-thousand, in gold, was extracted. One hundred and fifty thousand, is the value of Copper obtained from a mine at Copperopolis.

The very rich mine of Santa Rita del Cobre, in New Mexico, (now Arizona,) on the head waters of the Gila, has been suspended by the rebellion. Its nearest port of delivery is at Lavacca, in Texas, at a distance of between 700 and 800 miles. It was, notwithstanding, a profitable mine.

There are heavy veins of Copper, and Copper Ore, near the Maricopa village, on the Gila river, and also North of the Gila, to the East of the Colorado.

The Copper in the veins at Santa Cruz, and near Tubac, will be an object whenever railways penetrate that country.

Near the North line of California, in Oregon, and not far from the Portland meridian, Dr. Evans found specimens of native Copper, in which Dr. Jackson detected Gold.

COMPARISON OF THE GOLD AND SILVER BEARING ROCKS OF THE UNITED STATES, WITH THOSE OF MEXICO AND OTHER COUNTRIES.

COUNTRY & LOCALITY.	MINERAL CONTENTS OF THE VEINS.	PHYSICAL CHARACTER OF THE VEINS.	GEOLOGICAL FORMATIONS.	AUTHORITIES.
<i>Mexico: Real del Monte.</i> Bisciana vein, sixty miles North of the City of Mexico.	Lead Carrying Silver, known as "Argentiferous Galena."	Strike E. and W.; dip southerly, with cross veins N. and S. 9,300 ft. above the Ocean; 1,500 ft. deep; yield, in (5) years-prior to 1860, \$11,823,803.—Yield, per ton, \$55.57. Vein 25 to 30 ft. wide.	Feldspathic Porphyry.	H. Ehrenberg. Ure's Dictionary of Arts.
<i>Zacatecas:</i> "Veta Grande" (or Great Vein.)	Argentiferous Galena.	Vein 50 to 150 ft. wide.	Greenstone and Clay Slate Metamorphic.	Ure's Dictionary of Arts.
<i>Guanajuato:</i> Veta Madre, (or Mother Vein.)	Argentiferous Galena; the Silver carrying 1-360 parts Gold. Only proper Gold mine in Mexico.	Veins narrow. Vein matter carrying 7 to 18 pennyweights of Gold per ton.	Clay Slate Porphyry Granite.	Ure's Dictionary of Arts.
<i>Oajaca:</i>			Gneiss and Mica Slate, at Cardonel in Clay Slate; at Xocama and Loma del Torro in Silurian limestone.	Prof. Blake.
<i>Brazil: San Juan del Rey.</i> Eastern slope of the Andes.	Auriferous Quartz.		Granite, Gneiss, and Horn Blende rocks.	Prof. Blake.
<i>Australia:</i> On the eastern slopes of N and S ranges of mountains.	Iron pyrites carrying Gold. Auriferous Quartz.		Igneous & Metamorphic rocks, overlaid by Silurian Limestone.	Calvert's Gold Fields, &c.

COMPARISON OF THE GOLD AND SILVER BEARING ROCKS OF THE UNITED STATES, WITH THOSE OF MEXICO AND OTHER COUNTRIES—Continued.

COUNTRY & LOCALITY.	MINERAL CONTENTS OF THE VEINS.	PHYSICAL CHARACTER OF THE VEINS.	GEOLOGICAL FORMATIONS.	AUTHORITIES.
<i>Corwall, England</i> :— Britannia Vein.	Iron pyrites, quartz. Clay and Gossan carrying Gold.		Granite protruding in Clay Slates, (Killas) cut by dykes (elvans) of porphyry.	Calvert's Gold Fields, &c.
<i>Wales</i> :	Iron pyrites, quartz Copper and Zinc, carrying Gold. Argen- tiferous Galena.			Calvert's Gold Fields, &c.
<i>Russia</i> : Ural Mountains; Eastern flanks. Berevosk and Nijsy, Tajilsk.	Iron pyrites carrying Gold. Auriferous quartz.		Talcosc, Chloritic, and Clay Slates; Horn Blende rocks, and Silurian limestone.—Richest where greenstone, porphyry and serpentine cut the Silurian strata. Metamorphic rocks.	Geological Surveys of Russia.
<i>Canada East</i> : River Chaudiere.	Auriferous quartz.			Canada Reports.
<i>Virginia</i> : East of the Blue Ridge.	Iron and Copper pyrites, auriferous quartz yielding 2 to 16 oz. per ton.	Strike North east; dip Southeast- erly.	Micacious talcosc, and clay slates.	J. D. Whitney.
<i>North Carolina</i> :	Iron and Copper pyrites. Heavy veins of cellular auriferous quartz.		Micacious and talcosc slates.	J. D. Whitney.

<p><i>Arizona</i>: near Tubac; Heintzelman Mine.</p>	<p>Copper pyrites, iron and quartz; carbonate of Copper, malachite, doubtless carrying Gold, but the principal contents of this vein are Lead charged with Silver.</p>	<p>Strike a few degrees East of North; dip Westerly 80 degrees. Width 2 to 3 feet.—Yield, by assay of specimens, four (4) per cent. Silver.</p>	<p>Metamorphic Slate, overlaid by Limestone.</p>	<p>W. Wrightson.</p>
<p><i>Arivaca Ranche</i>: Same neighborhood.</p>	<p>Argentiferous lead; copper pyrites; auriferous quartz; muriate and iodide of silver; carbonate of lead.</p>	<p>Metamorphic Slates.</p>	<p>Metamorphic Slates.</p>	<p>H. Ehrenberg.</p>
<p><i>Santa Rita</i>: Mines near Fort Buchanan, Arizona.</p>	<p>Argentiferous lead, copper and iron pyrites, zinc, manganese. The lead yields, by assay, 48 ounces of silver to the ton.</p>	<p>Vein 30 inches wide. Strike N. 82 deg. E. Nearly vertical.</p>	<p>Feldspathic and porphyritic rocks.</p>	<p>R. Pumpelly.</p>
<p><i>Ojero Mine</i>: Gila vein, near the Santa Rita.</p>	<p>Argentiferous lead, black fahl ores, copper pyrites, zinc, iron, antimony, manganese, native silver, fluor-spar, calc.-spar, quartz gypsum.</p>	<p>Strike N. 69 deg. to 71 deg. E.; dip Southerly 81 deg. A net work of veins, with clay seams. The Salero vein bears N. 35 deg. E., and intersects the Gila vein.</p>	<p>Feldspathic porphyry and Horn Blende rocks, near granite.</p>	<p>R. Pumpelly.</p>
<p><i>New Mexico</i>: <i>Santa Rita del Cobre</i>; 60 miles W. of Fort Thorn.</p>	<p>Native Copper auriferous, carbonate of copper.</p>	<p>Porphyry and Granite protruding in carboniferous limestone.</p>	<p>Porphyry and Granite protruding in carboniferous limestone.</p>	<p>Dr. Antisell. W. Wrightson.</p>

COMPARISON OF THE GOLD AND SILVER BEARING ROCKS OF THE UNITED STATES WITH THOSE OF MEXICO AND OTHER COUNTRIES—Continued.

COUNTRY & LOCALITY.	MINERAL CONTENTS OF THE VEINS.	PHYSICAL CHARACTER OF THE VEINS.	GEOLOGICAL FORMATIONS.	AUTHORITIES.
<i>Stephenson Mine:</i> 18 miles Northeast of Fort Fillmore, New Mexico.	Argentiferous galena, copper pyrites carrying gold, ferruginous clay.	Six quartz veins; one set N. and S. Dip W. 75 deg. 12 to 20 ft. wide. Another N. 20 deg, E. Dip Easterly 75 deg.	Feldspathic porphyries, granite and sienite, cut by traps, and dykes, overlaid by grits and limestone of the carboniferous era gypsum.	Dr. Antisell. W. H. Ritter.
<i>Nevada Territory:</i> Washoe Mines, eastern base of the Sierra Nevada.	Argentiferous galena, with threads of native silver; auriferous quartz.	Heavy veins or beds of quartz, traceable many miles.		Land Office Reports, 1862.
<i>California:</i> Western base of the Sierra Nevada.	Iron pyrites and quartz carrying gold.	Main system of veins N. 5 deg. to 10 deg. W., with a system of cross veins.	Trachyte, micaceous & talcose slates overlaid by metamorphic sandstone, limestone, and conglomerate of recent formations. Igneous rocks.	Prof. Blake.
<i>Idaho:</i> On the Naches river.	Auriferous quartz.	Heavy veins, bearing Northeast and Southwest with the Mountain ranges.		Pacific R. R. Surveys, v. 12.
<i>Idaho:</i> Big Hole, fork of Wisdom River; eastern spurs of the Rocky Mountains.	Auriferous quartz.		Not described.	Capt. Mullen, (T. E.) C. E. Galpin.
<i>British Columbia:</i> Frazer's River.	Auriferous quartz, yielding 12 pennyweights per ton.		Quartzose sandstone, adjacent to metamorphic rocks.	John Calvert.

By attentively considering the character of the wall rocks, the mineral contents of the veins and their metallic products, as embodied in the foregoing table, it will be seen that the laws of nature are uniform.

When the rocky strata of the Sierra Nevada and the Rocky Mountains were ascertained to be similar to those of the Southern Cordilleras it was safe to predict, the existence of precious metals. This is a sure deduction from geological rules. For three hundred years the Spaniards in Mexico, Peru, and other South American Colonies, had extracted silver and some gold from the veins of the metamorphic and silurian rocks. It was not therefore a mere speculation or prophecy but a reliable conclusion of science that these rocks extending northward through the United States would contain the same metals.

Father De Smedt, and other catholic missionaries reported to Captain McClellan (now General McClellan), in charge of one of the parties exploring for a North Pacific Railroad, that there are veins on the Kootanie River near our Northern boundary from which they procured lead. From what is known of the rocks of the Kootanie region, they resemble those of Arizona, which embrace lead veins that carry silver commonly called "argentiferous galena." Lead veins with such geological associations, usually produce silver in other mining regions of the old and of the new world. These facts establish a law, in reference to mineral veins.

The sulphurets of iron and copper from veins in the metamorphic rocks, or veins proceeding from them, into silurian or carboniferous limestones, carry gold. Veins of sulphuret of lead in the same rocks produce silver. It must be the same on the Kootanie River; if it is true that the metamorphic rocks constitute the walls of those veins.

Professor J. C. Booth, the well known assayist of the mint at Philadelphia, has tested a large number of the lead ores of the United States. There are very few of them, whatever their geological relations, that have not some silver. Those of the sedimentary rocks of Wisconsin and Iowa are deficient, and they are veins which have not been traced to the azoic rocks in a single instance.

There is a belt of limerock, in many places known to be carboniferous, tilted up by the metamorphic and igneous rocks below; and which extends from Arizona along the Rocky Mountain Range into Canada. Veins of argentiferous galena may be expected at the junction of these two systems, along the entire range. At present the only portion of the immense mineral region of the Pacific Slope, which has undergone a detailed geological examination is California. Mr. Trask, Professor Blake, and Mr. Whitney, have explored the State of California with great labor, and professional skill. The final report of Mr. Whitney is not yet made. As he has ample means furnished by the State, and the requisite scientific ability that portion of the

country will soon be thoroughly understood. Dr. Evans unfortunately died before his report upon the valley of the Columbia was written out. In Arizona, Colorado, Nevada, Utah, Oregon, Idaho and Washington, this work is yet to be done. Our information in regard to these territories is derived principally from the Pacific Rail Road Reports. The commissioner of the land office has for two successive years applied to Congress for the sum of \$10,000 to aid in collecting through the surveyors of the public lands, statistics in reference to minerals. He has not been able to obtain this or any sum for that purpose. At the last session *six hundred and ninety three thousand* dollars (\$693,000) were appropriated to extend and repair buildings in Washington City.

It is not claimed that surface examinations will determine absolutely the value of a mineral region. This can only be done by the miner. But judicious explorations by practical men are necessary preliminaries. There is no other way of determining in advance the *probable* value of a country. An acquaintance with the age, the chemical composition, the stratification, and the vein systems of the formations, will decide what minerals exist, and how they are to be wrought, and the probable quantity that may be expected.

The geologist is the pioneer of the local explorer, and of mining operations. It is for him also to decide what may

not be found, and for which it would be useless to explore. The experience of other countries and the labors of other men, applied to similar objects, are thus made available.

Placers and gold washings are less subject to rules than vein mining. In local operations there are over small districts, deposits that have some uniformity. But the distribution of alluvial gold is generally accidental. It sometimes has a rich "course" or deposit, along the bed of an ancient river, now covered by sand and gravel or recent lava as in Australia; or where it was distributed throughout heavy beds of superficial materials, heretofore known as "diluvium," and sometimes as "drift," through which a recent river had cut itself a channel. These are the washing operations of nature, by which a small quantity of widely diffused metal is concentrated in long, irregular lines, as the water ran its natural course. When such ancient water courses have been concealed by geological changes, they can only be rediscovered by actual exploitation.

There was also a more universal and wide-spread mode of gold concentration, brought into play since the formation of the veins. It was the *drift power* or "*forces*," whatever they were, by which, in those parts of the earth toward the poles beyond parallels 40 and 45, the surface of the rocks has been abraded, crushed and pulverised. This process involved the destruction of veins which pre-existed in the strata. The drift agent was at first the irresistible one of glacier ice, which once enveloped the earth, to-

wards the poles. In latitudes nearer the equator than the Arctic and Antarctic circles, it was probably a mixed force, composed of moving ice and water. But whatever it was, the evidence is everywhere abundant that it transported materials broken off the rocks away from the colder to the more temperate zones. In the Northern Hemisphere the movement was southerly. Fragments of northern rocks, under the well known name of boulders, and in the form of small stones, gravel and clay, have been thus carried many hundred miles. The strata over which they were borne, are smoothed, polished and scratched, showing lines, grooves, and ridges, evidently made by hard bodies, moving in a southerly direction. Where there are chains of mountains the movement was in some cases outward from the main line, or centre, as is seen in the glaciers of the Alps. In other cases where lesser ranges lie oblique to the general course of the drift, the direction is changed by such minor elevations acting as barriers. A force sufficient to break off and carry away masses of stone, gravel and dirt, is equal to the transportation of pieces of copper, iron ore, lead, silver, gold or whatever else was enclosed in the rocks. Accordingly, boulders of native copper are found in the loose materials, scattered all the way from Lake Superior to Lake Erie, and even further south. If the smaller pieces of this metal, the grains and scales, that exist in the veins in Situ, were like gold, imperishable, they might have been found much further from the original deposite. In examin-

ing a new country for stream or alluvial gold, the evidences of drift action should not be neglected.

The debris of transported rocks indicate what formations there are in the direction from which they came. Pieces of quartz, spar, and other vein matter, found in the gravel, are "float mineral," brought on a large scale from a great distance. There are other modes, in which rocks and their enclosed veins are disintegrated and transported. It may be by the influence of climate upon soft strata, or by chemical changes. The transporting power of currents of water, if long periods of time are allowed, is very great. Pebbles that have their origin upon large rivers, and are moved only by freshets, a few feet once or twice in a year, travel, in the lapse of centuries, many miles. Scales and the finer particles of gold are easily moved in this way; and by whatever mode the loose materials are mixed and moved about, gold being heavier than the soil, earth or gravel, gravitates towards the bottom, and lodges at various depths upon the surface of the rocks.

Gold washings are the first resource in all countries, because neither machinery, skill or capital is required. Savage people of ancient times, had no difficulty in separating gold dust from soil by the use of water. A few tools and implements, such as a man may carry, comprise the outfit. It is a mineral that every one can recognize. In its native and separate state, as soon as a few grains or scales

are gathered, it has the value of money. The negroes of Central Africa, and the Indians of Peru used it conveniently in this state, before coin was known to them. But superficial washings are rapidly exhaustive. The skill, machinery and capital applied to placer workings in California and Australia; have given new confidence in the durability of diluvial gold. They have enlarged the probable value of such deposits above that of shallow stream works, and brought them up to the character of mines. But for a perpetual supply we must look to the primitive deposits in veins. The ledges, beds and veins of auriferous quartz, from which the floating gold is derived, penetrate the rocks to such depths that they may be regarded as inexhaustible. It is the same with veins producing copper, in which gold is a constituent. The same rule also prevails in the case of lead mines that carry silver, and in which this metal is procured by regular mining. It is a slower process, but one upon which our ultimate reliance must be placed.

SILVER MINES AND MINING CENTRES.

The crest of the elevated region of Sinaloa, and Sonora, fronting the gulf of California; is rich in silver mines for a distance of 500 miles. It extends into Arizona, and up to the Gila River. In the Mexican State of Sonora on the South, there are 27 mining establishments. With an enterprising people, and a stable government, there would be ten times that number within as many years. Mineral veins exist across the entire mountain country; to the Sierra Mimbres and the Sierra Madre; on the waters of the Rio Del Norte. Although gold is found it is but little worked. At present the most promising mining center of Arizona, is at the head waters of the Santa Cruz and the San Pedro Rivers. The government has recently caused a road to be surveyed from Fort Buchanan through the Mexican territory to the port of Lobos. This is by far the best outlet for the mining region around Tubac. The route is descending all the way, following the valley of the Altar and St. Ignacio Rivers. It passes through a comparatively smooth country with an abundance of water and grass, and some settlements. The distance is less than 200 miles. This corner of Sonora is of so much consequence to the territory of Arizona that it is to be hoped our government will make efforts to purchase it from Mexico. Without this route the army supplies, and those for the mines must come by way of Fort Yuma, at least twice the distance, and over much worse roads. A

Steamer makes monthly trips between San Francisco and the Colorado, at the present time. Four months in the year small Steam Boats may ascend the Colorado to the mouth of the Mohave River.

The "*Sonora Exploring and Mining*" Company, took the lead in operations upon silver producing veins in Arizona. There are remains at Tumacacari a few miles south of Tubac of ancient smelting works of the early Spaniards. Most of the work of the Sonora Exploring and Mining Company was done upon the "Heintzelman mines" about 20 miles west of Tubac, under the direction of W. Wrightson, Esq. The depth to which the vein has been explored, and its thickness, dip and bearing are given in the table of mines. Specimens that I have seen from this and the Santa Rita veins, 15 miles east of Tubac, contain a great variety of valuable minerals. From the Heintzelman mine green and blue carbonate of copper, chloride of silver, sulphuret of copper, and argentiferous lead. The gangue is principally quartz, and the wall rock clay slate of the metamorphic series. An assay made at the mint gives for one specimen, including the quartz and iron vein matter: (4.20) four and $\frac{2}{10}$ of silver, with a trace of gold. The sulphurets of copper and lead, when separated, yielded 11.60 to 19.20 of silver. Argentiferous galena from the "crystal" vein of the Santa Rita mines gave 48 ounces per ton. This was taken at 12 feet from the surface, where the vein was 30 inches wide; the

wall rock porphyritic. The vein matter is quartzose. A smelting of 1900 pounds of lead, from Santa Rita, gave (\$197) one hundred and ninety seven dollars in silver. About 25 miles south west from Tubac is the Arivacca Ranch where, there is gold bearing quartz and 40 or 50 miles north west is the Cahaubi mining location. Going north at 10 miles the old " *Sopore* " mine and Ranch is passed, situated upon a branch of the Santa Cruz River. At 40 miles is San Xavier, and at about 70 miles the old Maricopa mines are reached to the north of Tucson, upon the Gila River. There are placers upon the San Pedro which were once in high repute among the Mexicans. They are also known in the country west of Tubac, and up to the Gila, as far as the head of the Gulf of California. General Heintzelman who was on military duty in Arizona many years, regarded the country north of the Gila as highly promising for gold. Some 25 miles north east of Fort Yuma he reports the existence of both silver and gold near the Colorado River. Recent accounts from Los Angeles confirm this view.

Parties from there and from San Francisco, passing through Los Angeles, have crossed the Colorado near the south east corner of California, and returned well supplied with gold dust. They represent the placers as remarkably rich, but water is very scarce.

Ninety miles east of Tubac, are the " Patagonia," " Empire," and " French " mines, not yet opened, which carry silver and lead. Still farther east, at about sixty miles, are

the "Babacomori" veins, with silver, copper and lead. There are gold washings on the Mimbres river, fifty miles south west of Fort Thorn. To the east of Rio del Norte, in the Organ and Guadalupe Mountains, there is an important development of silver producing veins. Mr. W. H. Ritter, a mining engineer of repute, has examined a family of veins, 18 miles north east of Fort Fillmore, known as the "Stevenson Mine." The rocks are sienite granite, and porphyry rising through Devonian and Carboniferous strata. Here the sulphurets of copper and lead carry gold and silver. The vein matter is ferruginous and clayey, forming gossan in the decomposed portions, and yielding an average of \$70 per ton. The great mine of Real del Monte, in Mexico, has an average of \$55 per ton. This range extending northerly towards Santa Fe, is likely to be in future the seat of important mines. The great copper mine at "Santa Rita del Cobre," in the Mimbres mountains, has an appreciable quantity of gold in combination with native copper. In the eastern flanks of the San Bernandino Range, towards the valley of the Mohave River, are the usual protrusions of porphyry and trachytic rocks in metamorphic limestones. There are the same tertiary conglomerates as in Sonora, and the same limestones as in the Chiracahuihui mountains, where there are veins of argentiferous galena. We may well presume, therefore, that silver bearing veins will be found along the intermediate portions of the Sierra Nevada Range, from the Colorado to the Washoe mines. Silver has al-

ready been discovered in veins at Round Valley, near Mariposa.

Washoe is the centre of a remarkable mineral region at the eastern foothills of the Sierra Nevada, on the waters of Carsons river, in latitude about 39° north. Here are powerful veins, ledges and masses of quartz that carry lead and silver. The silver is frequently seen in its native form in thread like coils, but is generally diffused throughout "galena" or sulphuret of lead. The ledges or veins are not destitute of gold. This region has produced, according to the San Francisco Price current, \$6,000,000 during the year 1862, principally in silver. Mining enterprises are spreading eastward along the valley of the Humboldt River to Reese River, 150 miles from Washoe. This is as far to the north as silver has been wrought, but if we can rely upon geological indications, this metal should be found in Oregon and Idaho, especially on the Kootanie River, as above named.

DISTRIBUTION OF PLACERS AND GOLD BEARING VEINS.

Although there is but one gold mine, proper, in Mexico,—which is in the State of Oajaca, South of the National Capital—yet gold is frequently found in small quantities. Some of the silver bearing veins produce a small proportion of gold; and in the Northern States there were, at one time, profitable placers. Those near the heads of the Gila, and on the waters of the San Pedro, were most prominent. Placer gold was also found lower down the Gila river, and near the head of the Gulf of California.

In those Southern regions, where the drift action, to which I have before alluded, was less intense, the rocks have been less abraded, and their debris not so much mixed or transported.

Under the same circumstances, in other respects, a better display of placer gold should be expected in the more Northerly regions of Pikes' Peak, Idaho, Oregon, and Columbia. Here the disintegrating process has been assisted by powerful glacier action. North of our boundary between latitude 50 and 52, there are glaciers at this time in the Rocky Mountain range. Whatever there is in nature calculated to destroy rocky strata operates much more effectually in those latitudes where the drift action was most conspicuous. These are the best agents for separating gold from its matrix, on a large scale.

On the waters of the Gila, and those of the lower Del Norte, and of the Colorado, there was not only a diminution of the drift forces, but water for working is not as abundant there as it is farther North. This explains why, in the arid regions of Northern Mexico, and Arizona, placer gold has never been extensively wrought. The existence of gold dust, in the superficial materials there, has been known from the early Spanish occupation. Besides, there is a want of transportation, which has always been expensive, owing to distance, and dangerous on account of Indians. At present the forces of the United States occupy the valley of the Gila. As soon as confidence is restored the best situations will be determined, artificial modes of supplying water will be brought into use, and surface gold will be produced.

Everything indicates a rich region for placers North of the Gila. One party recently brought into Los Angeles \$24,000 in dust. The deposits are rich and extensive, but sadly destitute of water. All the expeditions which have crossed the upper valley of the Colorado, found gold in numerous places.

On the head waters of the Rio del Norte, above Santa Fe, gold washing is now going on; and, also, on the upper branches of the San Juan—a tributary of the Colorado, in the Territory of Colorado.

The operations of which Pike's Peak and Denver City are

the center, are sufficiently well known. The amount received at the mint from there, in 1862, was \$8,521,000. These works embrace not only extensive washings on the head waters of the Arkansas, and the Nebraska, but regular mine work upon quartz veins.

There is reported to be parties at work on the Western slopes of the mountains, in the valleys at the head of Grand River. Between these works and the most Easterly placers of Nevada, there is a country not yet explored; but the new diggings are every season approaching each other from both directions. During the past year most cheering developments have taken place within the new Territory of Idaho.

Last Fall many emigrants who were destined for Oregon, diverged from the route at Fort Hall, taking a Northerly direction. Owing to a sudden change to the Westward, in the direction of the Rocky Mountains at the Black Hills, a Northerly course from Fort Hall brought them again to the East of the range, and to the head waters of the Missouri. Their principal object was to locate around the sources of Jefferson's Fork, on the "Big Hole Prairie," in a region which trappers, and government exploring parties, have represented as very attractive for farming purposes.

Capt. Mullen, of the United States Engineers, has been engaged several years in making a road from the navigable waters of the Missouri, at a point near the Great Falls, to

the navigable waters of the Columbia, at the mouth of the Walla Walla River. His Report, which is of great interest, was made last Winter, and is ordered by Congress to be printed. He found the mountain chain to be low and narrow. From latitude 40 deg. North to the Kootanie pass, near the British line, the general elevation of the backbone of the range is about 6,000 feet above the Ocean. The climate in the valleys is so moderate that Capt. Mullen prosecuted his work on the road, without interruption, in Winter. He remained in the mountain region four years, with his party, and speaks of it as desirable for agriculture, without reference to minerals. In the "Deer Lodge" valley, on the Western slope, the Indians pasture their horses through the Winter, where the snow does not exceed three inches in depth. About (600) six hundred families had arrived at the heads of the Missouri before the season of emigrant travel closed in 1862. They saw that the rocks, and the associated gravel and earth, resembled those of Pike's Peak. As soon as they began to wash the soil, they discovered gold, and were able to send down the river a sum that I am satisfied exceeds a quarter of a million.

Capt. Galpin, of the steamer Shreveport, carried \$180,000 to St. Louis, principally from the Grasshopper Fork and the Beaver Head valley. There has been an arrival of treasure from the same region this Spring.

The emigrant road from the head of navigation, on the

Missouri, at Fort Benton, passes the mountains by the "Little Prickly Pear" river, where there is gold. It follows the Northwest bank of the Missouri, above the Falls, about 125 miles, and, turning up the Little Prickly Pear, attains the summit in about twenty-five miles. The river is navigable above the Falls, for small boats, to the point where the road leaves it. Across the summit are the head waters of the "Hell Gate" river, embracing the beautiful Deer Lodge valley, where gold diggers are already at work.

In the valley of Clark's Fork, of the Columbia, at Pend Oreilles, and about Fort Colville, there are washings for gold. They are also at work on the heads of Salmon river, from latitude 44 to 45 deg., on the West side of the Rocky Mountains, opposite the Big Hole Prairie. These diggings are nearer to the old Oregon route than those on the heads of the Missouri.

At Fort Boisé, directly on this route, and on Lewis' Fork of the Columbia, gold dust has been produced.

Making due allowance for the attractions that all new countries possess in the eyes of those who are the first to occupy them, there is abundant evidence of the mineral value of the central parts of Idaho. Its products will be more abundant and regular because it is desirable in other respects. It is accessible by water one half the year. From the head of navigation, on the Columbia, a rail road is already in course of construction, up the valley of the

Walla Walla, in the direction of the Rocky Mountains. The distance between the present landings, on the East of the Mountains, to those on the West, is said to be less than 700 miles. There is plenty of water and timber in the intermediate country, which is also represented to be healthy.

PRODUCT OF GOLD AND SILVER IN THE UNITED STATES.

Our own mines are the principal sources from which our precious metals are drawn. Silver has, thus far, played only an insignificant part; but it must be different in future. From 1841 to 1862, the entire product of silver in the United States, which reached the mint, was only \$5,226,441. Of this more than one half was extracted from native gold, in which it exists as an alloy. Gold now constitutes, substantially, the metallic basis and circulation of this country—and of the world. In the United States, the State of California has hitherto been the main resource.

As no rental or tax is paid on gold mines, it is not possible to determine precisely the amount produced. In the British Colonies, there are modes of obtaining exact accounts of the gold of their mines and placers; but, with us, there is nothing certain beyond the official statements of the receipts at the mint. Our most precise and laborious statisticians differ materially in their estimates of the yield of Cali-

foria. I shall present the figures given by our best authorities, and leave the reader to affix to each their due weight. After this is done, it will be very instructive to examine the general specie account of the country. This cannot be exactly stated, and for many reasons. Gold and silver arrives in, and departs from, the United States in other ways than the course of trade. A pound of gold dust, or coin, is worth from 250 to 300 dollars, according to its purity. Emigrants, who reach here from the Old World, have their principal wealth in the form of gold, which soon enters into circulation. Adventurers in the mines from Central and South America, from Europe, and even from Asia, can carry about their persons, on their return home, the results of their good fortune. Those processes are an offset to each other, but there are no reliable means of striking the balance. What goes out and returns in the course of trade, appears upon the Custom House records. What is sunk, for the purposes of traffic and circulation, in the form of ornaments and utensils of luxury, in the arts, and in dentistry, can only be roughly estimated. Mr. Pollock, the director of the United States Mint, places the sum of (140,000,000) one hundred and forty millions to this account in the United States. The loss by accident, and by abrasion, of coin, he considers has generally been overestimated. In England the wear of sovereigns is put at 1-10th of one per cent. per annum; but, by experiments, at our mint, it is, for American gold, less than 1-3550ths part.

Loss of coin by abrasion depends upon the activity of its circulation, and, therefore, cannot be uniform. The English sovereigns would disappear, by use, in one thousand years, while the American eagles would last four or five times as long. Some tables, relating to these subjects, will be given below.

In stating the products of the California gold fields, the receipts at the mint, its branches, and assay offices, are the only certain data. Mr. Whitney, in preparing his great work upon the "Metallic Wealth of the United States," took much pains to determine the amount which left the country in an irregular way. So far as our own citizens are concerned, it must soon find its way to the mint, except the small quantity of dust that is absorbed by jewelers and artisans. From thirteen to twenty millions remain permanently in California, in common use, taking the place of a paper circulation. Before the branch mint was established there, in 1852, a large portion of what left the country was in private hands, of which no public account can be had. Mr. Whitney estimates the sum carried away by foreign miners, in 1848-9, at \$10,000,000. The highest estimate of our own writers, for the best year, is \$55,500,000, and of the British, \$70,000,000. As between the average of the best general estimates, and the receipts at the mint, there is a difference, as appears below, of \$138,728,249, in a period of fourteen years.

PRODUCT OF PRECIOUS METALS IN CALIFORNIA AND OTHER PARTS OF THE UNITED STATES.

COUNTRY AND PERIOD EMBRACED.	AM'T IN DOLLARS.	No. Yrs.	ANNUAL AVERAGE	AUTHORITY AND REMARKS.
GOLD.—SOUTHEASTERN STATES, 1804 to 1848,-----	2,513,687	44		Deposits at the Mint; Report on the Finances.
UNITED STATES, besides California, 1848 to June, 30, 1862,-----	23,855,246	14		Report on the Finances; See Table A.
CALIFORNIA, 1848 to 1862; fiscal years,-----	528,137,069	14	37,724,076	Reports on Finances.
Total of Gold,-----	554,506,002	58		Deposits at the Mint.
Total of Silver, 1841 to 1862,-----	5,226,441	21		Deposits at Mint; Total dep's 559,732,443.
COLORADO: Calendar year, 1862.—Gold-----	8,521,100	1		Total deposits, in part, included above as prior to June 30, 1862.
OREGON, UTAH, AND WASHINGTON, 1852. ---Gold-----	5,000,000	1		San Francisco Price Current, Jan'y 9, 1863
NEVADA: Gold and Silver—1862,-----	6,000,000	1		(A portion of this went to the Mint previous to June 30th.)
IDAHO, East of the Mountains,-----	250,000	1		“ “ “ “
	19,771,000			Estimates of persons who purchased dust.
<i>Estimates of the total product of California:</i>				
1860-61-62, (calendar) -----	129,440,569	3	42,857,715	San Francisco Price Current, Jan. 9, 1863. Received from the Mines; Imported besides, \$10,347,437.
1848 to 1857, (fiscal year)-----	416,000,000	9	46,222,222	Dr. R. S. Fisher.
1848 to 1849, (calendar)-----	260,000,000	6	43,333,333	J. D. Whitney.
1849 to 1859, “-----	503,666,000	10	50,366,600	Bankers' Magazine.
1848 to 1856, “-----	443,090,000	8	55,386,250	British Parliament Reports.
Average of the above Estimates-----			47,663,237	At which rate, total of 14 years, \$666,855,318. Deposits at Mint, \$528,137,069.

TABLE A.

Deposits at the Mint of the United States, other than from California, from 1848 to 1852.

(Reports of Director of the Mint.)

STATE OR TERRITORY.	GOLD IN DOLLARS.	STATE OR TERRITORY.	SILVER IN DOL'S.
Tennessee,-----	198,920	California,-----	8,224
Alabama,-----	81,406	Michigan: L. Superior,	106,364
Georgia,-----	6,909,128	North Carolina,-----	41,808
North Carolina,-----	9,113,974	Arizona,-----	25,722
Virginia,-----	1,558,805	Sonora,-----	1,220
Utah,-----	80,067	Nevada,-----	1,073,408
Arizona,-----	21,500	Ex. from native Gold,	3,969,634
Nebraska,-----	1,402		
Oregon,-----	963,458	Total,-----	5,226,441
Nevada,-----	53,846		
Colorado,-----	4,735,049		
New Mexico,-----	56,929		
Other sources,-----	82,332		
Total, 1848 to 1862, (fiscal years.)-----	23,855,246		

PRESENT YIELD IN GOLD AND SILVER,
Of the Mines of the United States, with an Estimate for 1867 and 1872.

STATE.	PRODUCT OF 1862.	ESTIMATE FOR 1867.	1872.
California, -----	50,000,000	65,000,000	50 per cent. added to the estimates of 1867.
Colorado, -----	8,521,000	20,000,000	
Nevada, -----	6,000,000	20,000,000	
Oregon and Washington, -	1,000,000	2,000,000	
New Mexico & Utah, -----	150,000	5,000,000	
Idaho, -----	250,000	10,000,000	
Other Territories	100,000	500,000	
Arizona, -----	-----	5,000,000	
Total, -----	66,021,000	127,500,000	191,250,000

ACCUMULATION OF TREASURE.

The reports of the Secretary of the Treasury in reference to the exports and imports of coin and bullion, do not extend farther than the year 1821. In reference to the amount of precious metals within the United States, the official estimates begin in 1844. In 1821 the country had not recovered from the effects of an exhaustive war. The number of Banks was few, their capital small, and their paper depreciated. The stock of specie must have been low, for the population, and the consumption for jewelry, gilding, and arts generally, must have been small.

It would be very satisfactory if a statement, or a fair estimate, could be made of the stock of coin and bullion on hand at the time when our tables of exports and imports commence. This is the best starting point in the specie account of the nation. Before 1821 our domestic product was quite insignificant—only about \$100,000. From that year to 1844, inclusive, the balances of trade were so much in our favor that we had gained \$22,949,012. Our domestic product increased from \$100,000 to \$9,769,352, making a total addition of \$32,718,362.

The Secretary of the Treasury, in his report of 1856, estimates the available amount of coin and bullion in the country, in 1844, to have been *one hundred millions*, and, in 1856, *two hundred and fifty millions*.

Of the stock on hand in 1844, about two-thirds, or \$66,000,000, must have been derived from private importation, by emigrants, and from the remains of what was in the country in 1821. How can these two amounts be determined?

Many attempts have been made by able writers, such as Humboldt, Jacobs and McCulloch, to ascertain the rate of disappearance of specie. The results are so wide apart that they can scarcely be regarded as statistics, but some of them will be given below. In 1843 the *London Economist* fixes the annual consumption in the United States, from all causes other than the abrasion of coin, at \$2,500,000 per annum. The different circumstances of the population of Europe, when compared with ours, renders a calculation here, made upon the European basis, of little value. Silver, which constitutes much of the circulation in the Old World, disappears four times more rapidly than gold. In this country the silver circulation is small. It enters, however, largely into manufactures.

From 1837 we have annual returns of specie in the vaults of organized banks. It was then \$37,915,390, and the white population of the United States about *twelve and three-quarters millions*. This is about \$3.07 to each individual. In 1860 there was in vault \$90,289,762, and a white population of 26,973,843. The ratio of specie had increased very little in twenty-three years, being about

The object of such discussions is to enable those whose duties or whose inclination it may be to investigate the financial condition of the country in coming times to form correct opinions. In the present freedom of commerce, the precious metals flow over the earth like the currents of the ocean, without reference to national boundaries. The condition of other nations and their products in treasure, affect us and every other trading people. To determine how we may stand in future, we must know not only what the surplus metallic production of the United States will be, but also what will be the probable drain from us by foreign nations. In summing up the product of this country hitherto, the returns of domestic coinage furnish correct data so far as bullion and dust reaches the mint. So far as the specie basis of paper circulation is concerned, the reports of the Banks present reliable facts as to the amount in the country. By the annual Reports on the Finances, we are posted as to the depletion of coin by the foreign demand, all together forming a good ground work for general estimates.

Before making an exhibit for the year 1862, I give a table showing the relation of specie in bank to the ascertained and estimated population since 1821.

RATIO BETWEEN SPECIE IN THE BANKS OF
THE UNITED STATES AND THE POPULATION.

DATE.	WHITE POPUL'ON.	SPECIE IN BANKS.	SPECIE IN THE COUNTRY.	AUTHORITY, &c.
1820	7,861,931*	20,000,000†		At \$3,00 per person, \$23,585,793.
1830	10,537,378*	30,000,000†		At \$3,00 \$31,721,134.
1837	12,750,000†	37,916,340		New Am. Cyclopedia, ratio per individual \$3,13 of specie in b'k.
1840	14,195,695*	Wanting.		Cyclopedia. Finance Reports, ratio 3,07— ratio of est'ate \$6,10.
1844	16,250,000†	49,898,269	100,000,000	Finance Report.
1850	19,553,111*	45,379,345		Finance Report.
1851	20,750,000†	48,671,048		Finance Rep't. Depo- sits in U. S. Treas- ury included.
"	" " " †	59,835,775		" " "
1856	24,150,000†	59,314,663	250,000,000	Ratio \$2,80, do. of esti- mate \$10,30.
1860	26,973,843*	90,289,762		" " "
1862	28,000,000†	105,546,215	275 to 300 ms.	Ratio \$3,34. " " " Ratio in Bank, \$3,76, do. of estimate, \$9,81 to \$10,71.

*Census.

†Estimate.

In the United States coin has never constituted the ordinary circulation, except in California. At the present time, and since the rebellion commenced, paper money has been legal tender. Specie is no longer used even for small change. The ordinary wear of coin is now scarcely appreciable. Improvements in electro-gilding and plating has reduced the demand for those purposes. The actual destruction and loss cannot exceed *one half* of one per cent. What is secreted among the people should not be regarded as a loss, but rather as a safe deposit, which will come forth at the time when it is most needed. While the whole value of manufactures, into which the precious metals enter, is not far from *twenty millions*, the absorption should not exceed half that sum, or \$10,000,000 annually.

To determine how much of the domestic specie product of the United States between 1844 and 1856 remained in the country at the latter date, is nearly impossible. Outside of California the home product in these (12) twelve years varied but little from (24) *twenty-four* millions. The difference between the receipts at the mint from California, and the average of the estimates above given, is (19½) nineteen one half per cent. This excess went out of the country privately, was absorbed by manufacturers in form of dust, or went into circulation in California as private coin, in all amounting to about \$80,000,000. How much of it shall be assigned to each of these modes of disappearance ?

In round numbers the total domestic product received at the mint between 1844 and 1856 is (326) *three hundred and twenty-six* millions and one-half. During the same time there was an excess of exports of specie over imports amounting to *two hundred and seven* millions and one-half, leaving an ascertained balance in our favor of *one hundred and nineteen* millions. If we assume that the stock on hand in 1844 was \$100,000,000, and allow two per cent. for loss and disappearance in all forms, there would be remaining at the end of twelve years the sum of seventy-six millions. Some deduction should be made for disappearance from the newly acquired stock of our own production, most of which increase accumulated subsequent to 1848. At two per cent. a year this, for eight years, is \$19,040,000, leaving in round numbers *one hundred* millions of the new product; and of the old and new stock, together 176 millions. Under the Secretary's estimate of 250 millions, there remains 74 millions to be accounted for, a part of which is covered by private specie circulation in California.

By using the estimated product of California prior to 1856, instead of the receipts at the mint, the total of the home supply is *four hundred and four* millions and one quarter. On this basis, after subtracting the balance of exports, and the amount lost and absorbed at the above rates, there should have been in the country in 1856 *two hundred and fifty-six* and one quarter millions, without

taking private importations or exportations into the account. We have been accustomed to regard the specie brought by emigrants, as an important source of supply.

Without it we have no mode of accounting for the presence of the 100 millions supposed to be in the country in 1844. Nearly one half of that sum reached the United States in other ways than by importation or production. Perhaps *two* per cent. is too low for depreciation, loss and absorption of coin, during the period under review, but if so *one* per cent. must also be below the truth previous to 1844. Perhaps the estimated product of the country is too large, but most writers have made it larger. The amount of coin in bank in 1856 was not *ten* millions more than in 1844; and in proportion to population it was less than at any time since the returns have been made. The country, in both periods, was suffering one of those periodical depressions in business and credit that result from extravagant living, speculation and debt. Between 1844 and 1856, the coinage had increased rapidly, amounting in the intermediate years to \$405,649,640 of gold, and \$40,539,759 of silver. The total of coinage exceeds the domestic product deposited at the mint about 120 millions, and the average estimate of home production 42 millions. As a part of this was domestic coin recast, the fact of increased coinage throws very little light upon the subject of the origin and the disappearance of our precious metals. To explain the anomalies con-

nected with it, requires an investigation to be carried on with the government aid and facilities.

A general statement for 1862 will be found nearly as follows:

Stock in hands of Banks, Bankers and			
the people,	-	-	- 275 to 300 millions.
Home product, (Calendar year)	-	66	" millions.

Annual Disappearance.

1st. Consumed in the arts, (large estimate)		10	millions.
2nd. Loss by accident,	"	"	1½ millions.
3rd. Loss by paid foreign nations average 14 years, 1848 to 1862, per annum,	-	-	- 31 millions.
			<hr/> 42½ millions.

GOLD AND SILVER OF OTHER COUNTRIES.

History gives some information respecting the precious metals among ancient nations. In all ages the principal concentration has been with the people who were the most commercial. When the Greeks held that position the channels of the traffic centered with them. In the days of Herodotus they procured gold from the far off nations of Scythia; at the base of the Ural Mountains, where the Russians do now. Alexander the great procured about \$400,000,000 in his conquests in Asia, most of which came to enrich the Grecian people.

In those barbarous days, plunder was one of the objects of war, and gold was one of the most convenient forms of plunder. When the centre of trade was transferred to Rome, that city became the principal magazine for the precious metals. They were derived from washings in Asia and Africa. At the decline of the Roman Empire, and the simultaneous decay of commerce, gold and silver almost disappeared from view. During the Dark Ages trade between nations was limited. A writer in the *Continental Monthly* for March, 1863, estimates the total of treasure in commercial use throughout Europe; when America was discovered, at \$57,000,000 only; less than there is now in the city of New York. When mankind began to awake and resume their enterprise, specie became the first object of their attention. Spain had some limited mines of silver, and

the sands of Africa produced a little gold. It soon became known that America was rich in precious metals, and all Europe was aroused. There was a steady accumulation there from this continent during three hundred years. In 1819 the chief deposits of the Ural and the Altai Mountains in Russia, began to affect the markets of the old world. The possession of California by the United States, led to another and a large addition to the common stock in 1848, and in 1852, a powerful stream of gold set in from the opposite side of the world in Australia. The increase has thus been much more rapid than the increase of population. But to arrive at the precise sum is impracticable. Reports upon coinage are accessible from the principal commercial countries such as France, England, Mexico, Russia and the United States. I give the returns for those countries :

RETURNS OF COINAGE FROM THE PRINCIPAL MINTS OF THE WORLD.

COUNTRY.	PERIOD EM- BRACED.	NO. YR'S	TOTAL IN DOLLARS.	ANNUAL AVERAGE.	AUTHORITY.
England, _	1372 to 1509	237	8,295,000	350,000	Chamber's Jour.
"	1603 to 1829	226	924,955,950	4,097,075	" "
"	1829 to 1862	33	315,044,050	9,546,800	Continental Mo.
Mexico, --	1535 to 1850	315	2,667,828,851	8,719,713	Dr. Fisher.
Russia, ---	1644 to 1862	218	2,088,220 000	9,579,000	Chamber's Jour.
France ---	1726 to 1862	136	1,641,000,000	12,066,000	Continental Mo.
U. States, [Assayed bars included.]	1792 to 1862	70	861,799,451	12,138,020	Finance Report.

In both production and coinage the United States takes the lead of all other nations, a position she is destined to hold. The mints of France and England are largely supplied by bullion from the United States. These encouraging facts will appear more fully by a comparison of the annual product of different countries throughout the world, that will be found below :

PRINCIPAL SOURCES OF SUPPLY DURING THE PRESENT CENTURY.

Banker's Magazine.

COUNTRIES.	A. D. 1800.		A. D. 1848.		A. D. 1858.
	GOLD.	SILVER.	GOLD.	SILVER.	GOLD.
A m e r i c a (with't Cal.,	9,600,000	35,000,000	10,500,000	31,000,000	60,000,000*
Europe,-----	750,000	2,800,000	1,800,000	6,600,000	7,750,000*
Russian Emp.,	500,000	1,000,000	20,500,000	1,000,000	17,500,000
Africa,-----	1,400,000		2,750,000		
A l l o t h e r countries, --	4,150,000	500,000	15,000,000	5,000,000	
California (av- erage 10 yrs.	-----	-----	-----	-----	50,366,600
Australia (av- erage 7 yrs.	-----	-----	-----	-----	58,703,143
Africa and S. of Asia. ---	-----	-----	-----	-----	8,250,000
Total.-----	16,400,000	39,300,000	50,550,000	43,600,000	201,579,743

*Gold and Silver.

GENERAL STATEMENT OF PRODUCT OF GOLD AND SILVER DURING THE CHRISTIAN ERA.

DATES.	COUNTRIES EMBRACED.	ANNUAL PRODUCT IN DOLLARS.		Coin and Bullion in Commercial use.	Precious Metals, all forms, Plate Bullion & Coin.	AUTHORITY.
		Gold.	Silver.				Total.
Time of Christ, Dis. of America.	Roman Empire, Europe, Europe, Commercial World, Europe and America, Europe and America.	.....	.....	427,000,000	200,000,000	Continental Monthly 1863.
A. D. 1500.	.....	.....	.....	57,000,000	.....	Tooke's Hist'y of Prices, '48.
A. D. 1500.	.....	.....	.....	170,000,000	.....	Continental Monthly.
A. D. 1600.	.....	.....	.....	105,000,000	.....	Chamber's Edinburgh Journal.
A. D. 1700.	.....	.....	.....	351,000,000	.....	Continental Monthly.
A. D. 1800, (a)	.....	.....	.....	1,125,000,000	4,960,000,000	Cont. Mo'ly & Bankers' Mag.
A. D. 1800, (b)	.....	.....	.....	.....	.....	McCulloch.
A. D. 1803, (c)	.....	.....	.....	.....	6,800,000,000	Tooke's History of Prices.
1492 to 1848, (d)	America, Europe and Africa.	850 000	450,000	.....	.....	.....
1492 to 1848, (e)	.....	.....	.....	.....	.....	.....
A. D. 1838, (f)	Europe, Russia & Amer.	.....	.....	30,000,000	.....	McCulloch.
A. D. 1848, (g)	Commercial World,	50,550,000	43,600,000	94,150,000	.....	Bankers' Magazine, 1858.
1848 to 1857, (h)	" (9 y' average)	110,333,000	61,111,000	171,444,000	.....	.....
A. D. 1850, (i)	Commercial World,	.....	.....	181,166,020	.....	McCulloch.
A. D. 1854	Commercial World,	119,523,600	47,443,200	166,966,800	.....	J. D. Whitney.
A. D. 1855	Commercial World,	.....	.....	.....	.....	Bankers' Magazine.
A. D. 1858, (k)	Commercial World,	.....	.....	4,000,000,000	.....	McCulloch
A. D. 1858	Commercial World,	.....	.....	.....	.....	Bankers' Magazine.
A. D. 1869	Commercial World,	.....	.....	.....	7,865,900,000	McCulloch.
A. D. 1862, (m)	Commercial World,	.....	.....	.....	.....	Continental Monthly.
A. D. 1862	Commercial World,	.....	.....	4,500,000,000	.....	.....

(a). Of the Plate, Bullion, &c. 2,500 millions in Gold.
 (b). 1800 to 1810 the Spanish American mines increased their product materially.
 (c). Of this, in Gold, 2 800 millions.
 (d). Total product. Gold, 2 165 millions; Silver, 5,400 millions.
 (e). 1800 to 1847, received in Europe, from all sources \$40,000,000 annually. Humboldt. In 1815, \$25,000,000 — J. Pollock, Director U. S. Mint.
 (f). 1810 to 1829, annual average, Brazil and Spanish America, \$20,184,190 — Jacobs.
 (g). Silver Coin in Europe, 1,610 millions. — Chambers' Jour.
 (h). Australia. 1852 to 1858 inclusive, annual average Gold, \$58,703,143 — Bankers' Magazine.
 (i). Mexico. 1850 — product of Silver, \$24,156,000 — Whitney.
 (k). 1859 — Product of Africa. Borneo, and South of Asia. \$8,250,000. — Bankers' Magazine.
 (m). 1860 — Europe and Asia, besides Australia, \$20,636,000. — Dr. Ure.

ERRATA.

Page 6, line 1: "of" between the words Cordilleras and North.

Page 7, line 6: "a" for "its."

Page 8, head of Table: "Authority" for "Authories."

Page 45, head: "Mezquite" for "Musquite."

Page 46, five lines from bottom: "65" for "55" millions.

Page 47, Oregon, Utah, &c.: "1862" for "1852."

Page 48, Table A, in Heading; "1862" for "1852."

I am in possession of valuable information in reference to the coal fields of Ohio, Kentucky, and Western Virginia; the copper mines of Lake Superior; the silver-bearing veins of Arizona, and the gold regions of Idaho.

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